

## Appendix B: Findings by the PTAB on Motivations to Combine

### **-01166 Final Written Decision:**

- A POSITA could have been motivated to combine the Bouevitch, Smith, and Lin Patents. *E.g.*, Ex. 2 at 33.
- The Bouevitch Patent “uses angular misalignment to control power in at least some embodiments” and does not teach away from using misalignment to control power. *E.g.*, *id.* at 32.
- The benefit of using a two-axis mirror (such as that disclosed by the Smith Patent) instead of a one-axis mirror (such as that disclosed by the Bouevitch Patent) would have been apparent to a POSITA without hindsight. *Id.*
- It would have been obvious to try using a two-axis mirror (such as that disclosed by the Smith Patent) instead of a one-axis mirror (such as that disclosed by the Bouevitch Patent), because “(1) there were only two solutions to the known need to deflect light beams with MEMS: 1-axis or 2-axis, (2) a person of ordinary skill in the art would have had a high expectation of success to try two-axis mirror control in Bouevitch, and (3) the result of the combination would be predictable.” *Id.* at 32–33.
- Combining the teachings of the Smith and Lin Patents would not have been “beyond the skill of a skilled artisan, even if feats of engineering are contemplated.” *Id.* at 33.
- Incorporating the teaching of a two-axis mirror (such as that disclosed in the Smith Patent) with a reference using a single-axis mirror (such as the Bouevitch Patent) was “a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter” because “[s]ingle-axis and two-axis mirrors were known to be interchangeable.” *Id.*
- Combining the Bouevitch, Smith, and Lin Patents would yield a predictable result. *Id.* at 34.
- Applying a two-axis mirror (such as that disclosed by Smith) to a reference that uses a single-axis mirror (such as Bouevitch) would have been beneficial “because choosing only a single axis for both port selection and attenuation may result in dynamic fluctuations of power crosstalk between ports as attenuation level is varied,” would reduce “the risk of the signal bleeding into a port that is adjacent to the output port along the switching axis, and would provide finer control over attenuation by allowing the use of the full dynamic range of the mirror tilt in the first axis for attenuation.” *Id.*
- A POSITA would have combined the teachings of the Bouevitch, Smith, and Lin Patents because (1) continuously controlled mirrors were known to be interchangeable with discrete-step mirrors; (2) continuously controlled mirrors allow arbitrary positioning of mirrors and can more precisely match the optimal coupling value; and (3) Lin specifically

teaches that its analog, continuous MEMS mirrors would be useful in optical switching applications like Bouevitch's and Smith's ROADM devices." *Id.* at 34–35.

- "[T]he use of analog continuous control was the known alternative to discrete (or step-wise) control, and would have been obvious to try and expected to work when applied to Bouevitch." *Id.* at 35.

**-01276 Final Written Decision:**

- A POSITA would have been motivated to combine the Bouevitch and Carr Patents. *E.g.*, Ex. 3 at 22–23.
- A POSITA would have been motivated to combine the Bouevitch and Sparks Patents. *E.g.*, *id.* at 24–26.
- The Bouevitch Patent does not teach away from using misalignment to control power, and "applying intentional misalignment for power control as disclosed by Carr would [not] destroy Bouevitch's principle of operation." *Id.* at 18–20.
- "[W]avelength-selective switches were known and described prior to the Patent Owner's priority date." *Id.* at 20.
- The Bouevitch and Carr Patents, rather than the '368 Patent (now, the '905 Patent), "sufficiently provide the motivation for the asserted combination[.]" *Id.* at 21.
- The benefit of using a two-axis mirror (such as that disclosed by the Carr Patent) instead of a one-axis mirror (such as that disclosed by the Bouevitch Patent) would have been apparent to a POSITA without hindsight. *Id.* at 21–22.
- It would have been obvious to try using a two-axis mirror (such as that disclosed by the Carr Patent) instead of a one-axis mirror (such as that disclosed by the Bouevitch Patent), because "(1) there were only two solutions to the known need to deflect light beams with MEMS: 1-axis or 2-axis; (2) a person of ordinary skill in the art would have had a high expectation of success to try two-axis mirror control in Bouevitch; and (3) the result of the combination would be predictable." *Id.* at 22.
- Combining the teachings of the Bouevitch and Carr Patents would not have been "beyond the skill of a skilled artisan, even if feats of engineering are contemplated." *Id.* at 22.
- Incorporating the teaching of a two-axis mirror (such as that disclosed in the Carr Patent) with a reference that uses a single-axis mirror (such as the Bouevitch Patent) "is a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter." *Id.*
- The combination of the Bouevitch and Carr Patents "yields a predictable result." *Id.*

- Intentional misalignment techniques taught by the Carr and Sparks Patents do not conflict with Bouevitch’s optical design. *Id.* at 25.
- The motivation to combine Bouevitch and Sparks does not come from the ’368 Patent (now the ’905 Patent) or amount to impermissible hindsight. *Id.*
- Incorporating the teaching of a two-axis mirror (such as that disclosed in the Sparks Patent) with a reference that uses a single-axis mirror (such as the Bouevitch Patent) “is a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter.” *Id.* at 25.
- The combination of the Bouevitch and Sparks Patents “yields a predictable result.” *Id.*

**-00731 Final Written Decision:**

- A POSITA would have been motivated to combine the Bouevitch, Sparks, and Lin Patents. *E.g.*, Ex. 4 at 30.
- The benefit of using a two-axis mirror (such as that disclosed by the Sparks Patent) instead of a one-axis mirror (such as that disclosed by the Bouevitch Patent) would have been apparent to a POSITA without hindsight. *Id.* at 25–26.
- A POSITA “would have been capable of overcoming any problems presented by technical issues” of combining the Bouevitch and Sparks Patents. *Id.* at 27.
- The Bouevitch Patent “uses angular misalignment to control power in at least some embodiments” and does not teach away from using misalignment to control power or “disrupt Bouevitch’s explicit teaching of parallel alignment.” *Id.* at 28.
- The Bouevitch and Sparks Patents are not “incompatible technologies.” *Id.*
- The costs of using a two-axis mirror (such as that disclosed by the Sparks Patent) do not “overcome the rationale” for combining the Sparks Patent with a reference that uses a single-axis mirror (such as the Bouevitch Patent). *Id.* at 28–29.
- It would have been obvious to try using a two-axis mirror (such as that disclosed by the Sparks Patent) instead of a one-axis mirror (such as that disclosed by the Bouevitch Patent), because “(1) there were only two solutions to the known need to deflect light beams with MEMS: 1-axis or 2-axis, (2) a person of ordinary skill in the art would have had a high expectation of success to try two-axis mirror control in Bouevitch, and (3) the result of the combination would be predictable.” *Id.* at 29.
- Combining the teachings of Sparks and Lin Patents would not “be beyond the skill of a skilled artisan.” *Id.* at 29–30.

- The Lin Patent “specifically teaches that its analog, continuous MEMS mirrors would be useful in optical switching applications like Bouevitch’s and Sparks’ optical switch devices.” *Id.*
- Incorporating the teaching of a two-axis mirror (such as that disclosed in the Sparks Patent) with a reference using a single-axis mirror (such as the Bouevitch Patent) was “a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter.” *Id.* at 30.
- The combination of the Sparks, Bouevitch, and Lin Patents would yield “a predictable result.” *Id.*
- The Sparks, Bouevitch, and Lin Patents “all address optical signal switches, that “the principles of operation of the MEMS-based actuating mirrors are essentially the same except that the mirrors of Sparks are actuatable in one more axis than those of Bouevitch,” and that a two-axis mirror in place of a one-axis mirror “would yield a predictable result of the same functionality (e.g., movement of a reflective surface in a first axis) yet with more control (e.g., the reflective surface moving in a second axis in similar manner as the movement in the first axis).” *Id.* at 30–31.
- “Continuously controlled analog mirrors” (such as those disclosed by the Lin Patent) “were recognized as interchangeable with discrete step mirrors.” *Id.* at 31.